MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology

Standard Reference Materials Program

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Gaithersburg, Maryland 20899-2322

SRM Number: 931f MSDS Number: 931f

SRM Name: Liquid Absorbance Standard for Ultraviolet and Visible Spectrophotometry

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SECTION I. MATERIAL IDENTIFICATION

Material Name: Liquid Absorbance Standard for Ultraviolet and Visible Spectrophotometry

Description: SRM 931f consists of three sets of three cobalt-nickel solutions (liquid filters) and one set of three blank solutions (12 ampoules total). Approximately 10 mL of liquid is individually flame-sealed in each glass ampoule which has been prescored for easy opening. Each set of 12 ampoules is packaged in a tray.

Other Designations: Cobalt and Nickel in Perchloric Acid (dioxonium perchlorate; perchlorate solution; hydronium perchlorate) and Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engravers acid)

Name	Chemical Formulas	CAS Registration Number
Perchloric Acid	$HClO_4$	7601-90-3
Nitric Acid	HNO_3	7697-37-2
Cobalt	Co	7440-48-4
Nickel	Ni	7440-45-9

DOT Classification: Corrosive, Liquid, N.O.S., UN1760 **Manufacturer/Supplier:** Available from a number of suppliers.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration		Exposure Limits and Toxicity Data		
Perchloric Acid	Level I: 25 mL/L		No TLV-TWA established		
	Level II:	24 mL/L	Rat, Oral: LD ₅₀ : 1100 mg/kg		
	Level III:	62.5 mL/L	Mouse, Subcutaneous: LD ₅₀ : 250 mg/kg		
	Blank:	9 mL/L	Dog, Oral: LD ₅₀ : 400 mg/kg		
Nitric Acid	Level I:	15 mL/L	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m ³		
	Level II:	22.5 mL/L	OSHA TLV-TWA: 2 mg/kg or 5 mg/m ³		
	Level III:	32.5 mL/L	Human, Oral: LD _{LO} : 430 mg/kg		
Cobalt	Level I:	3.7 g/L	ACGIH TLV-TWA: 0.02 mg/m ³		
			OSHA TLV-TWA: 0.1 mg/m ³		
	Level II:	7.4 g/L	Rat, Oral: LD ₅₀ : 6171 mg/kg		
	Level III:	11.1 g/L	Rat, Intraperitoneal: LD ₅₀ : 100 mg/kg		
Nickel	Level I:	3.5 g/L	OSHA TLV-TWA: 1 mg/m ³		
	Level II:	7 g/L	Rat, Intraperitoneal: LD ₅₀ : 250 mg/kg		
	Level III:	10.4 g/L	Rat, Oral: LD _{LO} : 5 mg/kg		

MSDS 931f Page 1 of 4

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Perchloric Acid	Nitric Acid			
Appearance and Odor: An odorless, colorless, hygroscopic liquid	Appearance and Odor: A white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light			
Relative Molecular Mass: 100.46	Relative Molecular Mass: 63.01			
Density (@ 22 °C): 1.764	Density: 1.0543 (10 % nitric acid)			
Solubility in Water: Soluble	Solubility in Water: Soluble			
Solvent Solubility: Not Available	Solvent Solubility: Decomposes in alcohol			

Cobalt	Nickel		
Appearance and Odor: A white to gray, odorless solid	Appearance and Odor: A lustrous white to grey crystal or powder		
Relative Molecular Mass: 58.93	Relative Atomic Mass: 58.69		
Density: 8.92	Density: 8.90		
Solubility in Water: Insoluble	Solubility in Water: Insoluble		
Solvent Solubility: Soluble in dilute nitric acid, hydrochloric acid and sulfuric acid	Solvent Solubility: Soluble in dilute nitric acid		

Note: The physical and chemical data provided are for the pure components. Physical and chemical data for this nickel-cobalt/perchloric acid-nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A Method Used: N/A Autoignition Temperature: N/A

Flammability Limits in Air (Volume %): UPPER: N/A

LOWER: N/A

Unusual Fire and Explosion Hazards: Although perchloric acid and nitric acid do not burn, they are powerful oxidizing agents that can react with combustible materials to cause fires. Nickel and cobalt are negligible fire hazards when exposed to heat or flames.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and perchloric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: X Stable Unstable

Conditions to Avoid: Avoid contact with incompatible materials.

Incompatibility (Materials to Avoid): Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Perchloric acid is incompatible with certain acids, combustible materials, metals, oxidizing agents, metal oxides, halo carbons, halogens, metal salts, and bases. Cobalt is incompatible with combustible materials, certain acids, oxidizing materials, and halogens. Nickel is incompatible with certain acids, metals, bases, oxidizing materials, halogens, reducing agents, and combustible materials.

See Section IV: Unusual Fire and Explosion Hazards.

MSDS 931f Page 2 of 4

Hazardous Decomposition or Byproducts: Hazardous decomposition of nitric acid and/or nickel nitrate can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO₂), nitrous oxide (N₂O), as well as nitric acid mist or vapor. Thermal decomposition of cobalt and nickel may release toxic and/or hazardous gases.

Hazardous Polymer	rization	<u> </u>	Will Occur		<u>X</u>	W	Till Not Occur
SECTION VI. HEALTH	HAZAR	ED DATA					
Route of Entry:	X	Inhalation	x	Skin	,	X.	Ingestion

Health Hazards (Acute and Chronic): Perchloric Acid: Perchloric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Nitric Acid: Nitric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material is extremely irritating to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Eye and skin contact may result in burns. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Cobalt: Cobalt is harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation to skin, eyes, mucous membranes, and upper respiratory tract. Inhalation may cause asthma-like symptoms with coughing, dyspnea, chest tightness, and wheezing. Ingestion of large amounts may produce a sensation of hotness with nausea, vomiting, and diarrhea. Eye contact may cause conjunctivitis. Skin contact may cause sensitization dermatitis. Cobalt is considered a potential carcinogen to humans by the International Agency for Research on Cancer (IARC).

Nickel: Nickel is harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation to skin, eyes, mucous membranes, and upper respiratory tract. Inhalation may cause cough, pneumonitis, and fever. Over exposure may result in headache, dizziness, and difficult breathing. Ingestion may produce headache, nausea, vomiting, dizziness, and gastrointestinal irritation. Skin contact may cause sensitization dermatitis. Nickel is considered a potential carcinogen to humans in the National Toxicology Program (NTP) Report and by the International Agency for Research on Cancer (IARC).

Medical Conditions Generally Aggravated by Exposure: Respiratory disorders, eye disorders, skin disorders, and immune system deficiencies.

Listed as a Carcinogen/Potential Carcinogen:

	res	110
In the National Toxicology Program (NTP) Report on Carcinogens	X*	
In the International Agency for Research on Cancer (IARC) Monographs	X*	
By the Occupational Safety and Health Administration (OSHA)		X

^{*} The NTP classifies nickel as an **Anticipated Human Carcinogen**. The IARC classifies cobalt and nickel as **Human Inadequate Evidence**, **Animal Sufficient Evidence** (Group 2B).

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

TARGET ORGAN(S) OF ATTACK: Perchloric Acid/Nitric Acid: The skin, teeth, eyes, and upper respiratory tract.

Cobalt and Nickel: The immune system (sensitizer).

MSDS 931f Page 3 of 4

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be taken in Case Material is Released or Spilled: Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

Note: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. DO NOT wear contact lenses in the laboratory.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Nickel*, September 10, 1998.

MDL Information Systems, Inc., MSDS Cobalt, September 10, 1998.

MDL Information Systems, Inc., MSDS Nitric Acid, March 12, 1998.

MDL Information Systems, Inc., MSDS Perchloric Acid, September 10, 1998.

<u>Hawley's Condensed Chemical Dictionary</u>, 11th Ed., 1987. The American Heritage: Stedman's Medical Dictionary, 1995.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.

MSDS 931f Page 4 of 4